What is claimed is:

1. A polymer comprising repeating units of ethylene and vinyl alcohol, characterized by a linear backbone with substantial absence of branching on the backbone; and

a steady state oxygen permeability coefficient substantially independent of the humidity, a strain hardening region, or a combination thereof.

2. A polymer comprising repeating units of ethylene and vinyl acetate, characterized by a linear backbone with substantial absence of branching on the backbone;

a plurality of acetate groups bonded to the backbone, the acetate groups being separated by x-2, x-1 or x carbon atoms and present in a ratio of 1:2:1, wherein x is an integer equal to or greater than 3.

3. The polymer of claim 1 or 2, wherein the polymer has a vinyl alcohol or vinyl acetate content of about 1 mol.% to about 75 mol.%.

4. The polymer of claim 1, wherein the polymer has a plurality of hydroxyl groups bonded to the backbone, the hydroxyl groups being separated by x-2, x-1 or x carbon atoms and present in a ratio of 1:2:1, wherein x ranges integrally from 3 to about 12.

5. The polymer of claim 2, wherein the polymer has a strain hardening region.

6. The polymer of claim 1 or 5, wherein the polymer is characterized by a slope of strain hardening coefficient of about 0.1 to about 10.

7. The polymer of claim 1 or 2, wherein the polymer has a molecular weight distribution of less than 5.

8. The polymer of claim 1 or 2, wherein the polymer has a molecular weight distribution of less than 3.

9. The polymer of claim 1 or 2, wherein the polymer has a molecular weight distribution of less than 2.

10. The polymer of claim 1 or 2, wherein the polymer has an oxygen permeability coefficient of less than 10 cc*mil /100 in^2*day*atm.

11. The polymer of claim 1 or 2, wherein the polymer has an oxygen permeability coefficient of less than 8 cc*mil/100 in^2*day*atm.

12. The polymer of claim 1 or 2, wherein the backbone has less than about 0.01 long-chain branch /1000 carbon atoms.

13. The polymer of claims 1 or 2, further characterized by an elongation at break of greater than about 100%.

14. The polymer of claims 1 or 2, further characterized by a one or both of maximum load of greater than about 4200 psi.

15. The polymer of claims 1 or 2, further characterized by an energy to break of greater than about 50 lb*in.

16. The polymer of claim 1, wherein the polymer is a copolymer consisting essentially of repeating units of ethylene and vinyl alcohol.

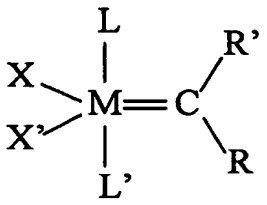
17. The polymer of claim 2, wherein the polymer is a copolymer consisting essentially of repeating units of ethylene and vinyl acetate.

18. The polymer of claim 1, wherein the polymer has a decomposition temperature of greater than about 305°C.

19. The polymer of claim 2, wherein the polymer has a glass transition temperature of less than about -30°.

20. A process for making a linear polymer of ethylene an vinyl alcohol, comprising:

contacting an unsubstituted cycloolefin with a compound represented by formula I:



(I)

to make a precursor polymer having olefinic unsaturation;

wherein M is selected from the group consisting of Os and Ru;

R and R' are independently selected from the group consisting of hydrogen and a substituent group selected from the group consisting of C_1 -C_{20} alkyl, C_2 -C_{20} alkenyl, C_2 -C_{20} alkoxycarbonyl, aryl, C_1 -C_{20} carboxylate, C_1 -C_{20} alkoxy, C_2 -C_{20} alkenyloxy, C_2 -C_{20} alkynyloxy and aryloxy; the substituent group optionally substituted with a moiety selected from the group consisting of C_1 -C_5 alkyl, halogen, C_1 -C_5 alkoxy, and phenyl; the phenyl optionally substituted with a moiety selected from the group consisting of halogen, C_1 -C_5 alkyl, and C_1 -C_5 alkoxy;

X and X' are independently selected from any anionic ligand; and

L and L' are independently selected from any phosphine of the formula $PR^3R^4R^5$, wherein R^3 is selected from the group consisting of neophyl, secondary alkyl and cycloalkyl, and R^4 and R^5 are independently selected from the group consisting of aryl, neophyl, C_1 -C_{10} primary alkyl, secondary alkyl, and cycloalkyl;

contacting the precursor polymer with a boron-containing compound capable of hydroborating the olefinic unsaturation to form an intermediate polymer; and

contacting the intermediate polymer with a mixture comprising an oxidizing agent to produce a polymer comprising repeating units of ethylene and vinyl alcohol.

21. The process as recited in claim 20 further including converting the ethylene vinyl alcohol polymer to an ethylene vinyl acetate polymer.

22. The process as recited in claim 20 or 21 wherein the boron-containing compound is 9-borabicyclo[3.3.1]nonane.

23. The process as recited in claim 20 or 21 the oxidizing agent is hydrogen peroxide.

24. The process as recited in claim 22 wherein the oxidizing agent further includes a hydroxide source.

25. The process as recited in claim 20 or 21 wherein the cycloolefin includes from 3 to about 10 carbon atoms per molecule.

26. The process as recited in claim 20 wherein the ethylene vinyl alcohol polymer includes a plurality of hydroxyl groups bonded to the backbone of the polymer, the hydroxyl groups being separated by x-2, x-1 or x carbon atoms, and being present in a ratio of 1:2:1, wherein x ranges integrally from 3 to 12.

27. The process as recited in claim 20 or 21 wherein the ethylene vinyl alcohol polymer has a steady state oxygen permeability coefficient substantially independent of the humidity.

28. The process as recited in claim 21 wherein the ethylene vinyl alcohol polymer is contacted with acetic anhydride to obtain the ethylene vinyl acetate polymer.